INTRODUCTION

Chemicals are certainly useful, on the job and off. But as we all know, many chemicals are hazardous to your health if you are exposed to them unknowingly or without taking the necessary precautions.

This safety training program is broken into two sections. The first section will provide you with information on hazardous chemicals and with procedures and equipment that will reduce your chance of exposure. To ensure that everyone gets this kind of information and protection, and to provide a uniform way of delivering it, OSHA has developed the Hazard Communication Standard. The basic goal of the standard is that you have a right to know about the hazards you face in the workplace and how to protect yourself from these hazards.

The second section of the training program deals with general laboratory safety. This section includes general chemical safety information, including the proper storage, handling, and disposal of laboratory chemicals in the workplace.

TRAINING OBJECTIVES

After completing this training, the attendee will be able to:

SECTION ONE- RIGHT TO KNOW/ HAZCOM

- Explain the OSHA Hazard Communication Standard
- Explain the Florida Toxic Substances in the Workplace Law
- Explain the elements of the NHMFL Safety Procedure 20, Hazard Communication
- Review of Hazard Evaluation
- Identify how to read and understand product labels
- Identify how to read and understand MSDS
- Identify the chemical inventory process
- Identify chemical procurement, shipping, and receiving

SECTION TWO- LAB SAFETY AND HAZARDOUS WASTE REQUIREMENTS

- Identify general chemical safety guidelines
- Understand detection and prevention of chemical hazards
- Hazard awareness evaluation
- Safely store and handle hazardous materials
- Be familiar with emergency procedures
- Understand hazardous waste requirements

N O T E S

OSHA is the Occupational Safety and Health Administration. Its purpose is to ensure safety in the workplace.

MSDS are Material Safety Data Sheets. They provide information on the hazards of the material.

N O T E S

The **Hazard Communication Standard**, or **HCS**, is developed to protect the safety and health of employees.

SECTION ONE

OSHA HAZARD COMMUNICATION STANDARD

The OSHA HCS is mandated by the federal government under the Code of Federal Regulations Title 29 Part 1910.1200. This standard requires employers to evaluate the potential hazards of materials in the workplace and to communicate those hazards to their employees.

The NHMFL is required to:

- Identify hazardous materials in the workplace
- Provide product warning labels on containers
- Provide and maintaining MSDS
- Establish a written Hazard Communication Procedure
- Train and notify workers on the hazards in the workplace
- Notify contractors, visitors and users of hazards

FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE LAW

This law is established by the State of Florida Statute Chapter 442, and requires any employer who produces, uses, or stores any listed toxic substance in the workplace to:

- Post a notice informing workers of their rights
- Maintain a MSDS file for 30 years for each listed toxic substance present in the workplace

- Make MSDS available upon request
- Provide training to employees within their first 30 days of employment and annually thereafter on the effects of toxic substances in the workplace
- Notify local fire department, emergency planning committees and state emergency response commissions of the names and locations of the listed toxic substances in the workplace

EMPLOYEE'S RIGHTS

Both the HCS and the Right to Know Law provide employees with the following rights:

- Know of toxic substances present in the workplace
- Obtain copies of MSDS
- Refuse to work under circumstances where not adequately trained
- Receive training on toxic substances including identification, safe work practices, first aid treatment, health effects of exposures, and emergency response
- Enjoy a workplace free from recognized hazards

N O T E S

N O T E S

NHMFL SAFETY PROCEDURE 20, HAZARD COMMUNICATION

The NHMFL has adopted a written safety procedure, titled **Hazard Communication**, to be followed by all employees, users, visitors, and contractors entering the facility to perform work. The safety procedure contains the following information:

- Explains the Chemical Inventory List
- Lists the methods to inform personnel of workplace hazards
- Explains the labeling system at the NHMFL
- Identifies the MSDS system
- Identifies training requirements for all personnel

This procedure is available from the Safety Office, your area coordinator, or can be viewed electronically via the NHMFL File Server.

HAZARD EVALUATION

The OSHA HCS requires all chemical manufacturers to evaluate their products and determine if there is any significant health or safety hazards related to the use of the products. Chemical manufacturers are required to develop MSDS for all materials they produce and to supply them to vendors upon request.

The NHMFL Safety Office maintains a master chemical inventory and MSDS file of all hazardous substances in the facility.

PRODUCT LABELS

All containers of hazardous substances must be labeled in English and provide at a minimum the following information:

- chemical name
- list of ingredients if the material is a mixture or solution
- appropriate hazard warning labels
- manufacturer's name and address

These labels must be maintained at all times and be clearly displayed. Other labels, such as the U.S. Department of Transportation hazard labels, may also appear on the container and should not be removed.

MATERIAL SAFETY DATA SHEETS

MSDS are provided for each hazardous chemical in the workplace. They provide specific information on the hazards of the material and how to safely store, handle, transport, and dispose of the material.

N O T E S

N O T E S

The MSDS is typically divided into eight sections and must contain at a minimum the following information:

- Chemical identity, synonyms or name used on label
- Physical and chemical characteristics
- Physical and health hazards
- Primary routes of entry into the body
- Established exposure limits
- Precautions for safe handling and use
- Control measures to protect the user
- Emergency and first aid procedures
- Date of preparation of the MSDS
- Name, address, and phone number of the manufacturer, importer, or responsible party

The main MSDS file is located in the **Hazard Information Center** in the atrium area. MSDS are also available on the World Wide Web via the NHMFL Home Page.

MSDS are received upon shipment of the materials to the lab. A copy is placed in the master file located in the main atrium area. A copy is also available to the person purchasing the material. This copy is to accompany the material to the work area or lab and shall be placed in that area's MSDS file. These files are to be updated whenever shipments of hazardous materials are received at the NHMFL.

CHEMICAL INVENTORY LIST

A chemical inventory list of all hazardous materials is maintained by the NHMFL Safety Office. This inventory is located in the Hazard Information Center in the main atrium area and is also posted throughout the facility. Each work area or lab is to maintain an inventory of the hazardous materials in use at their specific work area and to supply a copy to the Safety Office. Inventories are to be updated when a new material is obtained.

CHEMICAL PROCUREMENT, SHIPPING AND RECEIVING

Requisitions for the purchase of chemicals and hazardous materials must be approved by the Safety Office prior to the issuance of a purchase order. The Safety Office reviews the requisitions for any unique safety hazards or health effects and keeps track of the amounts of chemicals in storage at the NHMFL. All shipments of hazardous materials must be properly packaged, labeled and marked in accordance with DOT regulations prior to shipment. The NHMFL Shipping and Receiving Office will ensure that all packages are in accordance with applicable shipping regulations. Shipments to the NHMFL are received at the Shipping and Receiving Office and the appropriate personnel are contacted to pick up their packages.

N O T E S

The NHMFL **Shipping and Receiving Office** is located in the OPMD Building in room OP-129. The phone number is 644-0627.

N O T E S

SECTION TWO

GENERAL CHEMICAL SAFETY

Chemical safety depends on control and knowledge of hazardous materials and basic chemical properties. The most potentially dangerous materials are shipped, stored, handled, used and disposed of every day by trained personnel. All of these personnel are aware of the hazards involved with these operations and how to control the hazards. The following are general safety rules that are followed by safe personnel:

- All containers are labeled clearly and completely
- Chemicals are stored by the hazards they posses
- Eating, drinking, and smoking is not allowed in areas where hazardous materials are stored or used
- Read and understand warning labels and signs
- Safely transport, pour, and handle liquid and solid materials
- Use personal protective equipment as necessary
- Use fume hoods when handling materials
- Read MSDS for safety information before using a material
- Clean up and report spills promptly
- Use caution when mixing chemicals

- Always add acid to water
- Never pipette by mouth
- Secure compressed gas cylinders at all times
- Ask your supervisor or the Safety Office if you have any questions about a chemical or hazardous material

DETECTION AND PREVENTION OF CHEMICAL HAZARDS

- Chemical states and forms include:

liquids dusts
gases fumes
mists vapors

- Possible routes of entry into the body:

Inhalation- breathing
Absorption- into skin or eyes
Ingestion- eating, drinking
Injection- puncture

- Chemical exposure

Exposure is the unintentional contact with a chemical, biological, or physical hazard. Exposures are measured in terms of doses. A **dose** is determined by the amount or concentration of the hazardous substance multiplied by the time or duration of the exposure.

- Key terms

Acute: An adverse effect to an exposure with symptoms developing rapidly and quickly.

N O T E S

Sodium cyanide is an acutely toxic material.

N O T E S

Asbestos is a material which causes chronic health effects upon prolonged exposures.

Chronic: Exposure symptoms are usually delayed or cumulative, and result from repeated exposure to low levels of a hazardous substance over a prolonged period of time.

· Exposure standards

Permissible Exposure Limits (PEL): An exposure limit set by OSHA which employees can be exposed to without any adverse health effects or other precaution during a normal working day. These values are enforced as legal standards by OSHA.

Threshold Limit Values (TLV): A time weighted average concentration under which most people can work consistently for 8 hours a day, day after day, with no harmful effects. These values are recommendations and are published by the **American Council of Governmental Industrial Hygienists**, or the **ACGIH**.

· Control of chemical exposures

Controlling chemical exposures is the key to providing employees with a safe and healthy working environment. Methods used to control exposures include:

· Elimination of hazardous materials from the work site
· Substituting for less hazardous materials
· Isolation from the hazardous substance
· Ventilation
· Personal protective equipment
· Proper waste disposal
· Medical monitoring
· Training and education

CHEMICAL STORAGE

Proper chemical storage is critical in creating a safe workplace. Follow these basic guidelines:

- Store flammable and corrosive materials in approved safety cabinets or in a dedicated area
- Store highly toxic, radioactive, or controlled substances in a secure, lockable area
- Do not store chemicals in the fume hoods
- Do not keep chemicals longer than the indicated shelf life
- Dispose of peroxide forming chemicals before the expiration date on the container
- Oxidizing materials should be stored separately from flammable and corrosive materials
- Store compressed gas cylinders in designated storage areas
- Avoid storing chemicals on the floor or in high locations
- Keep all containers securely closed

HAZARD AWARENESS

Hazard awareness is recognizing and understanding the characteristics of a hazardous material and knowing how to protect yourself from those hazards. Hazard awareness can be improved by following these steps:

- Read and understand labels, signs and other warning information

N O T E S

Ethers and **tetrahydrofurans** are examples of chemicals which can form explosive peroxides upon prolonged storage.

A hazardous material is any chemical that has any health, physical, or safety properties.

N O T E S

- Consult the MSDS
- Keep your senses alert for unusual circumstances, escaping gases, leaking containers, odors
- Use the proper PPE
- Use caution when mixing and storing chemicals
- Label containers
- Use fume hoods when transferring chemicals
- Contact the Safety Office or your supervisor if you have any questions

STORING AND HANDLING HAZARDOUS MATERIALS

Segregate all incompatible chemicals for safe storage of hazardous materials. The use of secondary containment is recommended. Plastic or nalgene trays work well for storing small containers. Store materials according to their specific hazard or hazard class. The following hazard classes are all present at the NHMFL:

- Radioactive materials (Thorium, uranium oxide)
- Flammable and non-flammable gases (Argon, nitrogen)
- Flammable liquids and solids (Methanol, sodium metal)
- Oxidizers and organic peroxides (Sodium chlorate, benzoyl peroxide)
- Poisonous liquids and solids (Methylene chloride, phenol)

- Corrosive liquids and solids (Nitric acid, sodium hydroxide)
- Environmentally hazardous substances (formaldehyde, asbestos)

GENERAL PRECAUTIONS

- Flammable materials should be stored in an approved flammable materials cabinet. Keep all sources of ignition away from flammable materials.
- Store acids separate from other hazardous materials
- Never put acids in steel/metal containers
- Liquids should be stored using secondary containment devices
- Never store hazardous materials in the floor or higher than eye level
- Inspect containers for leaks or cracks
- Discard old, unwanted, damaged containers by contacting the Safety Office
- Don't store chemicals in the fume hoods

EMERGENCY PROCEDURES

A spill, leak, release, fire, uncontrolled reaction, explosion, or accidental contact with a hazardous material requires immediate action to prevent injury or property damage. Report any such emergency to the Safety Office immediately.

N O T E S

Safety Coordinator
Kyle Orth
644-0233 office
657-8278 pager

Hazardous Materials Manager
Todd Wegenast
644-6955 office
657-8279 pager

N O T E S

REPORT ALL SPILLS TO THE NHMFL SAFETY OFFICE !!!

Know the location of emergency equipment in your work area.

Emergency equipment should include fire extinguishers, safety showers and eyewashes, first aid kits, spill kits, alarms and phones.

CHECK, CALL, CARE

Follow these basic guidelines in an emergency situation:

- **Check** the scene for safety and then check the victim
- **Call** the NHMFL Safety Office, the FSU Police at 4-1234, or call 9-911 for emergency assistance
- **Care** for the victims or the scene if qualified

EMERGENCY GUIDELINES

- Evacuate the area and keep unauthorized persons out
- Refer to the MSDS or container label for safety precautions
- Contain the spill if possible, use absorbent materials
- Eliminate sources of ignition if flammable material
- If there is a fire, activate the building alarm system
- Stay on the scene, if safe, until emergency personnel arrive
- Care for victims and provide first aid if trained
- For skin or eye contact, immediately flush the materials with large amounts of water

SPILL CONTROL PROCEDURES

All areas where hazardous substances or wastes are generated or stored shall have spill control procedures in place to deal with minor spills. Spill kits shall be readily available in these areas. Minor spills, less than one pint of liquid or one pound of solid material, involving non-acutely toxic substances may be cleaned up by the personnel working in the area provided they have been trained and have the proper PPE on hand.

If a minor spill occurs, follow these procedures:

- Secure the area, notify other workers in the area
- Keep unauthorized personnel out of the spill area
- Identify the material and the hazards
- Consult the MSDS and container label
- Use the proper PPE
- Absorb and containerize the material
- Label the container with the contents and the words "**Hazardous Waste**"
- Contact the NHMFL Safety Office for pick up of the waste

For larger spills, spills of highly toxic substances, or for assistance contact the Safety Office. Also, refer to the NHMFL Safety Procedure, **SP-3 Emergency Action Plan** for more details.

N O T E S

The NHMFL Safety Office has placed spill kits in many labs and work areas throughout the facility. If your work area needs a spill kit, contact the Safety Office.

The Safety Office provides training on hazardous materials spill response.

N O T E S

HAZARDOUS WASTE REQUIREMENTS

All generators of hazardous wastes are required to be trained on an annual basis. This training is required for anyone who is responsible for the accumulation of hazardous wastes in their work area. This includes any faculty, staff, student, or maintenance personnel who are engaged in work that produces hazardous wastes.

WHAT IS A HAZARDOUS WASTE?

The requirements for the identification and listing of hazardous wastes are located in the Code of Federal Regulations Title 40 Part 261. Contact the Safety Office if you are interested in reviewing these requirements.

A "**waste**" is a material that is no longer wanted, needed, or which has no further use or application.

A "**hazardous waste**" as defined by the EPA, is a waste that:

(i) Causes, or significantly contributes to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

(ii) Poses a substantial present or potential hazard to human health or the environment when it is improperly treated, stored, transported, disposed, or otherwise managed.

These wastes can be either specifically listed or they may have certain characteristics which make them hazardous by definition. The listed and characteristic wastes are also found in the Code of Federal Regulations (CFR).

The **EPA** is the Environmental Protection Agency.

A waste is considered hazardous if it has any of the following characteristics:

- **Ignitability**- having a flash point <140°F/60°C
  Example: Acetone, methanol
- **Corrosivity**- having a pH <2.0 or >12.5
  Example: Nitric acid, sodium hydroxide
- **Toxicity**- based on the Toxicity Characteristic Leaching Procedure or TCLP
  Example: Barium and Mercury containing materials
- **Reactivity**- air, water, or other reactive materials
  Example: Sodium metal or cyanides

The NHMFL is classified as a conditionally exempt small quantity generator by the **Florida Department of Environmental Protection (DEP)**. This means that our entire facility generates or produces less than 100 kilograms of hazardous waste in one calendar month. The waste materials are picked up by a licensed and permitted hazardous waste transportation and disposal company on a quarterly basis or as needed.

CONTAINER MANAGEMENT

All hazardous waste accumulation points are required to follow proper container management practices. There are signs posted throughout the facility of the hazardous waste generation and accumulation requirements. These include using the safety containers provided for storing hazardous wastes. One gallon steel safety cans are provided for storing non-halogenated solvents (acetone, toluene, methanol) and one gallon polyethylene safety cans are provided for storing acid waste solutions. Labels attached to the cans are provided for marking the contents of the waste solutions. When a solution is added to the container, indicate the contents on the label. Contact the Safety Office when the containers are full or to arrange a pick up.

N O T E S

D001 is the waste code for ignitability.

D002 is the waste code for corrosivity.

D004-D011 are regulated toxic metals. These include arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.

D003 is the waste code for reactivity.

Many pesticides are regulated and carry characteristic waste codes.

Halogens are chlorine, fluorine, bromine and iodine. Solvents containing these are considered **halogenated**.

Each lab, work area or accumulation area should have assigned someone who is responsible for the storage and accumulation of hazardous wastes. This person will oversee the collection and disposal of these wastes by contacting the Safety Office.

N O T E S

The Resource Conservation and Recovery Act, or **RCRA**, passed by Congress in 1976 established the hazardous waste regulations. These laws established the "cradle-to-grave" tracking system for hazardous waste.

- Use safety containers for liquid wastes
- Use containers that are compatible with the wastes
- Label all containers with "**Hazardous Waste**"
- Label all containers with the contents and date filled
- Keep all waste containers closed securely
- Store incompatible wastes separate
- Check the condition of the containers for signs of leaks
- Use the proper PPE when handling and filling waste containers
- Don't dispose of wastes in the drains or in the trash
- Never mix radioactive wastes with other types of wastes
- Use secondary containment for storing waste containers

CONTAINER MANAGEMENT PRACTICES

COLLECTION OF HAZARDOUS WASTES

Contact the NHMFL Safety Office to arrange for the pick-up of hazardous wastes or to arrange a laboratory clean out. The Safety Office can provide waste containers and assistance in starting an accumulation area. Check your work areas monthly for old, outdated, spent solutions, or other waste materials and contact the Safety Office for a pick-up. If you have any questions, ask.

SUMMARY

As you can tell, the Hazard Communication Standard is a very significant regulation for anyone who works with, or has the potential for contact with, hazardous chemicals in the workplace. The standard ensures that every chemical we get comes with information on its potential hazards, via the MSDS system. Even more important the standard gives you, as an employee, the right to know about hazardous chemicals in the workplace and how to protect yourself from these hazards. From the information in this training program and your increased knowledge and awareness, the NHMFL will remain a safe work environment for all personnel.

APPENDIX A

LABORATORY SAFETY CHECKLIST

Follow principals of lab safety

__ Minimize all chemical exposures
__ Never underestimate risk
__ Use adequate ventilation
__ Take exposure limits seriously

Be familiar with

__ OSHA Hazard Communication Standard
__ NHMFL Safety Procedure
__ Chemical container labels
__ Material Safety Data Sheets
__ Exposure limits
__ Chemical physical and health hazards
__ Emergency procedures

Use required ventilation and protective equipment

__ Be sure the fume hood is operating properly
__ Don’t store chemicals or supplies in the fume hoods or block vents
__ Keep hood closed when not in use
__ Wear the appropriate personal protective equipment

Store, handle and dispose of chemicals safely

__ Keep inventories limited to what is needed
__ Keep inventory lists up to date
__ Be sure the containers are labeled
__ Use secondary containment for liquids
__ Avoid storing chemicals near heat, sunlight, or incompatibles
__ Keep materials properly segregated
__ Check condition of containers frequently
__ Carry chemical containers in a chemical bucket when transporting

__ Dispose of wastes promptly and properly
__ Never pour chemical wastes down the drain or place in the trash

Practice good hygiene

__ Don't eat, drink, smoke or chew gum in areas with hazardous lab chemicals
__ Wash hands before and after leaving the lab area
__ Don't store food items in laboratory refrigerators
__ Do not use mouth suction to start a pipette or siphon
__ Don't smell or taste chemicals

Practice good housekeeping

__ Keep work area neat
__ Never store or place materials in halls, aisles or exits
__ Don't block emergency equipment
__ If an experiment must be left unattended, leave warning lights or sign in
place to warn others of the hazards

Prevent fires and other lab hazards

__ Use tongs and heat resistant gloves with equipment that uses heat
__ Don't touch electrical equipment with wet hands and use ground plugs
__ Inspect electrical wires and plugs before use
__ Keep clothing or long hair away from moving parts and machinery
__ Keep compressed gas cylinders secure
__ Operate equipment that you have been trained on
__ Report any equipment that is not working properly

Act promptly and properly in an emergency

__ Clean up small spills and report them to the Safety Office
__ Contact the Safety Office for large spills
__ Know emergency evacuation procedures
__ For chemical inhalation, get to fresh air and call for help
__ For chemical ingestion, check the MSDS and call for help
__ For eye contact, wash immediately with large amounts of water
__ For skin contact, immediately flush the area with water

Use common sense

__ Be alert to any unsafe conditions and report them to the Safety Office
__ Never indulge in horseplay
__ Know the hazards of the material before you begin work